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Appeal Brief  
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Attorney Docket Number NL 021052

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Van Beek et al.  
SERIAL NUMBER: 10/531,934 EXAMINER: Estrada, Michelle  
FILING DATE: April 19, 2005 ART UNIT: 2823  
TITLE: Method for manufacturing a micro-electromechanical device and micro-electromechanical device obtained herewith

## APPEAL BRIEF

This Appeal Brief follows a final Office Action mailed from the U.S. Patent and Trademark Office on September 27, 2006 and Applicants' Notice of Appeal submitted December 28, 2006.

Applicants believe that a fee in the amount of \$500.00 is due under 37 C.F.R. §41.20(b)(2). Please charge this fee to Deposit Account Number 503344, Ref. No. 74079-001.

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Certificate of Deposit Under 37 C.F.R. § 1.8

Pursuant to 37 C.F.R. §1.8, I hereby certify that the attached Amendment and Response is being deposited with the United States Patent and Trademark Office via facsimile to 571-273-8300.

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1. Real party in interest

NXP Semiconductors is the real party in interest in this case.

2. Related appeals and interferences

No prior or pending appeals, interferences, or judicial proceedings are known to Appellants, Appellants' legal representative, or Assignee which may directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal in the above-referenced case.

3. Status of claims

Claims 1-5, 10, 12 and 13 were rejected in the Office Action of September 27, 2006. Claims 6-9 were considered to have allowable subject matter, and were objected to as being dependent on a rejected base claim.

Claims 1-10, 12 and 13 are pending. Claims 1-5, 10, 12 and 13 are here appealed.

4. Status of amendments

No amendments to the claims were made in Appellants' Amendment and Response of July 14, 2006.

5. Summary of claimed subject matter

Claim 1 is directed to a method for manufacturing a micro-electromechanical device (10), in which are consecutively deposited on a substrate (1) a first electroconductive layer (2) in which a first electrode (2A) is formed, a first electroinsulating layer (3) of a first material, a second electroinsulating layer (4) of a second material, different from the first

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material, and a second electroconductive layer (5) in which a second electrode (5A) lying opposite the first electrode is formed which together with the first electrode (2A) and the first insulating layer (3) forms the device (10), in which after the second conductive layer (5) has been deposited, the second insulating layer (4) is removed by means of an etching agent that is selective with respect to the material of the second conductive layer (5), characterized in that for the first material and the second material are selected materials that can be etched only limitedly selectively with respect to each other and for depositing the second insulating layer (4) on top of the first insulating layer (3) a further layer (6) is deposited of a further material that can be etched selectively with respect to the first material.

#### 6. Grounds of rejection to be reviewed on appeal

##### 6.1 Rejection of claims 1-5, 10, 12 and 13 under 35 U.S.C. §102(e)

Independent claim 1 and dependent claims 2-5, 10, 12 and 13 stand rejected under 35 U.S.C. §102(e) as being anticipated by Patel et al. (U.S. patent application publication number 2005/0074919, filed June 11, 2002).

#### 7. Argument

##### 7.1 35 U.S.C. §102(c)

##### 7.1.1 Introduction: history of prosecution

Claims 1-4 and 10-14 were initially rejected under 35 U.S.C. §102(c) in view of Kim et al. (patent application publication number 2002/0117668) in an Office Action dated November 23, 2005. Claims 5-9 were objected to as being dependent on a rejected base claim. Claims 11 and 14 were objected to under 37 C.F.R. 1.75(c). Applicants traversed

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rejection of claims 1-4 and 10-14 and canceled claims 11 and 14 in a Response dated February 6, 2006.

Claims 1-5, 10, 12 and 13 were rejected under 35 U.S.C. §102(e) in view Patel et al. in an Office Action dated April 18, 2006, and rejection of the claims in view of Kim et al. was withdrawn. Claims 6-9 were objected to as being dependent on a rejected base claim. Applicants traversed rejection of claims in a Response dated July 14, 2006.

Rejection of claims 1-5, 10, 12 and 13 under 35 U.S.C. §102(c) and objection to claims 6-9 that were presented in the Office Action dated April 18, 2006, were maintained in the final Office Action mailed September 27, 2006. Applicants submitted a Notice of Appeal on December 28, 2006.

#### 7.1.2 Characterization of cited prior art

The Office Action of September 27, 2006 rejects claims 1-5, 10, 12 and 13 as anticipated by Patel. Patel is characterized below in Section 7.1.3.1.

The subject matter of the present claims is summarized in Section 5 above.

#### 7.1.3 Claims 1-5, 10, 12 and 13

Appellants show below that claims 1-5, 10, 12 and 13 are not anticipated by Patel.

##### 7.1.3.1 Patel et al., U.S. patent application number 2005/0074919, filed June 11, 2002

Claims 1-5, 10, 12 and 13 stand rejected under 35 U.S.C. §102(e) as anticipated by Patel.

Patel shows methods for making microelectromechanical devices on a wafer. See Patel et al., patent application publication number 2005/0074919, ¶ [002]. Patel shows a method for manufacturing multiple microelectromechanical systems (MEMS) devices on a

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wafer, releasing MEMS structures by removing a sacrificial material, bonding a wafer to another wafer, singulating the wafer assembly, and packaging each wafer assembly portion with one or more MEMS devices thereon. Ibid.

In Patel, a sacrificial layer is deposited on a substrate. Ibid., ¶ [0019] and ¶ [0020]. A lithography step followed by a sacrificial layer etch forms holes in the sacrificial layer. Ibid., ¶ [0020]. Etching is performed down to the substrate or block layer. Ibid. A first layer is deposited by chemical vapor deposition (CVD), and the first layer undergoes lithography and etching so as to form gaps between adjacent movable elements. Ibid., ¶ [0021]. A second layer, also called a “hinge layer”, is deposited. Ibid., ¶ [0022].

The hinge layer is defined in Patel as the portion of the device that flexes to allow movement of the device, and can be disposed only for defining the hinge and other areas such as the mirror. Ibid., ¶ [0022]. The hinge layer is followed by a reflective and conductive layer. Ibid., ¶ [0023]. Photoresist patterning on the reflective/conductive layer is followed by etching through the reflective/conductive layer. Ibid. The sacrificial layer is removed to “release” the MEMS structures. Ibid.

Applicants’ Claim 1 in contrast is directed to a method for manufacturing a micro-electromechanical device, such that the following are consecutively deposited on a substrate: a first electroconductive layer in which a first electrode is formed, a first electroinsulating layer of a first material, a second electroinsulating layer of a second material, different from the first material, and a second electroconductive layer in which a second electrode lying opposite the first electrode is formed which together with the first electrode and the first insulating layer forms the device, in which after the second conductive layer has been

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deposited, the second insulating layer is removed by means of an etching agent that is selective with respect to the material of the second conductive layer, characterized in that for the first material and the second material are selected materials that can be etched only limitedly selectively with respect to each other and for depositing the second insulating layer on top of the first insulating layer a further layer is deposited of a further material that can be etched selectively with respect to the first material.

Claims 2-5, 10, 12 and 13 depend directly or indirectly from claim 1 and incorporate the subject matter of this claim and contain additional subject matter.

7.1.4 The present claims are not the same as the cited art

According to criteria established in the Manual of Patent Examining Procedure, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Manual of Patent Examining Procedure* § 2131 (8th ed., Rev. 4, Oct. 2005), citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q. 2d 1051, 1053 (Fed. Cir. 1987). Thus, the standard for rejection under 35 U.S.C. § 102 is identity.

Patel fails to show a method for manufacturing a micro-electromechanical device having a second electroinsulating layer of a second material, let alone show a method for manufacturing a micro-electromechanical device characterized in that for depositing the second insulating layer on top of the first insulating layer, a further layer is deposited of a further material that can be etched selectively with respect to the first material, to which Applicants' claim 1 is directed.

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The Office Action on page 4 alleges that Fig. 3D of Patel shows a further layer deposited of a further material that can be etched selectively with respect to the first material, stating that "...layer 20 is a metal or a metal alloy which is different to the first material and therefore they are selectively etchable with respect to each other."

However, as stated in Patel's specification at ¶[0026], Figs. 3A to 3E illustrate the same process as Figs. 1A to 1E, taken along a different cross section. Patel's specification in fact states:

[A] first layer 18 is deposited by chemical vapor deposition...[t]he first layer undergoes lithography and etching so as to form gaps between adjacent movable elements.... [See Patel, ¶ [0021]; emphasis added]

A second layer 20 (the "hinge" layer) is deposited as can be seen in FIG. 1 D. By "hinge layer" it is meant the layer that defines that portion of the device that flexes to allow movement of the device. The hinge layer can be disposed only for defining the hinge, or for defining the hinge and other areas such as the mirror. In any case, the reinforcing material is removed prior to depositing the hinge material. The material for the second (hinge) layer can be the same (e.g. silicon nitride) as the first layer or different (silicon oxide, silicon carbide, polysilicon, or Al, CoSiN<sub>x</sub>, TiSiN<sub>x</sub>, TaSiN<sub>x</sub> or other ternary and higher compounds) and can be deposited by chemical vapor deposition as for the first layer. [See Patel et al., ¶ [0022]; emphases added]

As also seen in FIG. 1D, a reflective and conductive layer 22 is deposited. The reflective/conductive material can be gold, aluminum or other metal, or an alloy of more than one metal though it is preferably aluminum deposited by PVD...[t]hen, photoresist patterning on the metal layer is followed by etching through the metal layer with a suitable metal etchant...[t]hen, the sacrificial layer is removed in order to "release" the MEMS structures (FIG. 1E). [See Patel, ¶ [0023]; emphases added]

Thus, in contrast to Applicants' claim 1, Patel shows only depositing a first layer 18, then a second "hinge" layer 20, then a reflective and conductive layer (i.e. metal layer) 22. The reflective and conductive layer 22 undergoes photoresist patterning following by etching through the layer.

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Applicants claim 1 is directed to a method of manufacturing a micro-electromechanical device such that for depositing the second insulating layer on top of the first insulating layer, a further layer is deposited of a further material that can be etched selectively with respect to the first material. Nowhere does Patel show that a further layer is etched selectively with respect to the first layer for depositing a second insulating layer on top of the first insulating layer, to which Applicants' claim 1 is directed. Factual analysis of Patel shows that the word "insulating" simply does not appear.

Applicants assert that, as Patel is not the same as the subject matter of claim 1, this claim is not anticipated by Patel. Claims 2-10, 12 and 13 depend directly or indirectly on claim 1, and incorporate all of the subject matter of this claim and contain additional subject matter. Therefore these claims also are not anticipated.

For any of these reasons, Appellants assert that the present claims comply with 35 U.S.C. §102(e), and respectfully request that rejection of claims 1-5, 10, 12 and 13 under 35 U.S.C. §102(e) be withdrawn.

Respectfully submitted,



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### 8. Claims appendix

1. (original) A method for manufacturing a micro-electromechanical device (10), in which are consecutively deposited on a substrate (1) a first electroconductive layer (2) in which a first electrode (2A) is formed, a first electroinsulating layer (3) of a first material, a second electroinsulating layer (4) of a second material, different from the first material, and a second electroconductive layer (5) in which a second electrode (5A) lying opposite the first electrode is formed which together with the first electrode (2A) and the first insulating layer (3) forms the device (10), in which after the second conductive layer (5) has been deposited, the second insulating layer (4) is removed by means of an etching agent that is selective with respect to the material of the second conductive layer (5), characterized in that for the first material and the second material are selected materials that can be etched only limitedly selectively with respect to each other and for depositing the second insulating layer (4) on top of the first insulating layer (3) a further layer (6) is deposited of a further material that can be etched selectively with respect to the first material.

2. (original) A method as claimed in claim 1, characterized in that the material of the further layer (6) is selected such that the second insulating layer (4) can be removed selectively with respect to the further layer (6).

3. (previously presented) A method as claimed in claim 1, characterized in that the second insulating layer (4) is first removed locally and preferably selectively with respect to the further layer (6) up to the further layer (6), then the further layer (6) is removed selectively with respect to the first insulating layer (3) after which the second insulating layer (4) is removed in its entirety.

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4. (original) A method as claimed in claim 3, characterized in that for the further material of the further layer (6) and for the material of the conducting layers (2,5) the same material is chosen and for removing the further layer (6) the second electroconductive layer (5) is covered with a masking layer (7) for the etching agent of the further layer (6).

5. (previously presented) A method as claimed in claim 1, characterized in that silicon nitride is chosen for the first material and silicon oxide for the second material.

6. (original) A method as claimed in claim 5, characterized in that an aqueous solution of ammonium fluoride ( $\text{NH}_4\text{F}$ ) and nitrogen fluoride ( $\text{HF}$ ) is chosen as an etching agent for removing the second insulating layer (4).

7. (previously presented) A method as claimed in claim 1, characterized in that the electroconductive layers (2, 5) and the further layer (6) are made of aluminum.

8. (original) A method as claimed in claim 7, characterized in that a mixture of phosphoric acid, acetic acid and sulphuric acid is chosen as an etching agent for the further layer (6).

9. (previously presented) A method as claimed in claim 1, characterized in that both the first conductive layer (2) and the second conductive layer (5) are formed as two interrupted parts ((2A, 2B), (5A, 5B)), the interrupted parts (5A, 5B) of the second conductive layer (5) being formed on top of the interrupted parts (2B, 2A) of the first conductive layer (2).

10. (previously presented) A method as claimed in claim 1, characterized in that all layers (2, 3, 4, 5, 6, 11) are deposited by means of CVD or sputtering.

11. (canceled)

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12. (previously presented) A micro-electromechanical device (10) obtained from implementing a method as claimed in claim 1.

13. (original) A micro-electromechanical device (10) as claimed in claim 12 and comprising a tunable capacitor.

14. (canceled)

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9. Evidence appendix

No evidence is submitted pursuant to 37 C.F.R. §§1.130, 1.131, or 1.132.

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10. Related proceedings appendix

There are no proceedings related to this appeal.